

Exhibit 1

Dr. Robert E. Briggs  
Curriculum Vitae

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Educational Background:

1975-1978 Iowa State University; Animal Sciences Pre-Vet  
1978-1982 Iowa State University; DVM 1982  
1982-1988 Iowa State University; MS 1988

Research Experience:

1982-1985	Postdoctoral Associate, Respiratory Disease of Cattle Research, USDA, ARS, NADC
1985-present	Veterinary Medical Officer, Respiratory Tract Diseases of Ruminants, USDA, ARS, NADC

Invitations in last 5 years:

Invited to National Cattlemen's Beef Association Annual Convention in Charlotte NC, February, 1998, to present ongoing research on mucosal *P. haemolytica* vaccine.

Invited to Schering-Plough Animal Health, Elkhorn, NE, October 1998, to present ongoing research on oral vaccination of cattle.

Invited to Pfizer Central Research, Groton, CT, June, 1999, to present research findings on oral vaccination against shipping-fever.

Invited to Schering-Plough Animal Health, San Diego, CA, October 1999, to present ongoing research on mucosal vaccination strategies.

Invited to USAHA meeting in San Diego, CA, October 1999, to present results of research on mucosal *P. haemolytica* vaccine.

Invited to USAHA meeting in Birmingham, AL, October 2000, to present progress on mucosal *P. haemolytica* vaccine.

Invited to Diamond Animal Health/AgriLabs, St. Joseph MO, October 2001, to present research on vaccination strategies for cattle.

Invited to National Cattlemen's Beef Association Annual Convention in Nashville TN, February, 2003, to present ongoing research on mucosal *P. haemolytica* vaccine.

Ad hoc reviewer for USDA NRI Competitive Grants Program, 1997-2003.

Referee for the journal "Vaccine", 1999, 2000.

External reviewer for Idaho Board of Education Research Center Grant Program, 1998.

Selected publications:

Sanders J. D., Y. Tagawa, R. E. Briggs, and L. B. Corbeil. Transformation of a virulence associated gene of *Haemophilus somnus* into a strain lacking the gene. FEMS Microbiol. Letters. 154:251-258. 1997.

Briggs R. E., and F. M. Tatum. *Pasteurella haemolytica* restriction endonuclease and methyltransferase. US Patent 5,683,900 issued November 4, 1997.

Briggs R. E., and F. M. Tatum. DNA encoding *Pasteurella haemolytica* *PhaI* restriction endonuclease and methyltransferase. US Patent 5,693,777 issued December 2, 1997.

Briggs R. E., and F. M. Tatum. Chimeric plasmid for introduction of DNA into *Pasteurella haemolytica*. US Patent 5,733,780 issued March 31, 1998.

Tatum F. M., R. E. Briggs, S. S. Sreevatsan, E. S. Zehr, S. Ling Hsuan, L. O. Whiteley, T. R. Ames, and S. K. Maheswaran. Construction of an isogenic leukotoxin deletion mutant of *Pasteurella haemolytica* serotype 1: characterization and virulence. Microb. Pathog. 24: 37-46, 1998.

Briggs R. E., G. H. Frank, C. W. Purdy, E. S. Zehr, and R. W. Loan. Rapid spread of a unique plasmid of *Pasteurella haemolytica* serotype 1 among shipped calves. Am. J. Vet. Res. 59: 426-430, 1998.

Briggs R. E., G. H. Frank, and E. S. Zehr. Development and testing of a selectable challenge strain of *Pasteurella haemolytica* for studies of upper-respiratory colonization of cattle. Am. J. Vet. Res. 59: 401-405, 1998.

Straus D. C., C. W. Purdy, R. W. Loan, R. E. Briggs, and G. H. Frank. In vivo production of neuraminidase by *Pasteurella haemolytica* in market stressed cattle after natural infection. Current Microbiology 37:240-244. 1998.

Purdy, C. W., Straus, D. C., Loan R. W., Briggs, R. E., Parker, D. B., Auvermann, B., Chirase, N., Storz, J., Williams, P. B. Analysis of endotoxin in feedyard air and playas: Endotoxin effect on market stressed feeder calves. pp. 2-3. In Proc. High Plains Beef Conference: Health, Nutrition and Environment. 1998.

Briggs R. E., and F. M. Tatum. Molecular genetic construction of vaccine strains of *Pasteurellaceae*. U.S. Patent 5,840,556 issued November 24, 1998.

Briggs R. E., and F. M. Tatum. Construction of *Pasteurella haemolytica* vaccines. U. S. Patent 5,824,525 issued October 20, 1998.

Briggs R. E., and F. M. Tatum. Construction of *Pasteurella haemolytica* vaccines. U. S. Patent 5,849,305 issued December 15, 1998.

Lehmkuhl H. D., R. E. Briggs, and R. C. Cutlip. Survey for antibodies to bovine adenoviruses in six- to nine-month-old feedyard cattle. *Am J Vet Res* 59:1579-1580. 1999.

Storz, J., Purdy, C.W., Xiaoqing, L., Burrell, M., Truax R.E., Briggs, R.E., Frank, G.H., and Loan, R.W. Isolation of respiratory bovine coronavirus, other cytocidal viruses, and *Pasteurella* spp from cattle involved in two natural outbreaks of shipping fever. *Journal of the American Veterinary Medical Association*. 216:1599-1604. 2000.

Frank G. H., R. E. Briggs, R. W. Loan, C. W. Purdy, and E. S. Zehr. Effects of tilmicosin treatment on *Pasteurella haemolytica* organisms in nasal secretion specimens of calves with respiratory tract disease. *Am J Vet Res* 61:525-529. 2000.

Fulton, Robert W., Purdy, C.W., Confer, A.W., Saliki, J.T., Loan, R.W., Briggs, R.E., and Burge, L.J. Bovine viral diarrhea viral infections in feeder calves with respiratory disease: Interactions with *Pasteurella* spp., parainfluenza-3 virus, and bovine respiratory syncytial virus. *The Canadian Journal of Veterinary Research*. 64:151-159. 2000.

Leite, F., Brown, F.J., Sylte, M.J., Briggs, R.E. and Czuprynski, C.J. Recombinant Bovine Interleukin-1 Beta Amplifies the Effects of Partially Purified *Pasteurella haemolytica* Leukotoxin on Bovine Neutrophils in a Beta-2-Integrin-Dependent Manner. *Infection and Immunity*. 68:5581-5586. 2000.

Storz, J., Lin, M., Purdy, C. W., Chouljenko, V. N., Kousoulas, K. G., Enright, F. M., Gilmore, W. C., Briggs, R. E., and Loan, R. W. Coronavirus and *Pasteurella* infections in bovine shipping fever pneumonia and Evans' criteria for causation. *Journal of Clinical Microbiology*. 38:3291-3298. 2000.

Purdy, C. W., Loan, R. W., Straus, D. C., Briggs, R. E., and Frank, G. H. Conglutinin and immunoconglutinin titers in stressed calves in a feedlot. *American Journal of Veterinary Research*. 61:1403-1409. 2000.

Jeyaseelan S, Kannan MS, Briggs RE, Thumbikat P, Maheswaran SK. Mannheimia haemolytica leukotoxin activates a nonreceptor tyrosine kinase signaling cascade in bovine leukocytes, which induces biological effects. *Infection and Immunity*. 69:6131-6139. 2001.

Briggs RE, Tatum FM. LKTA deletion mutant of *P. haemolytica*. U.S. Patent #6,331,303. December 18, 2001.

Frank GH, Briggs RE, Duff GC, Loan RW, Purdy CW. Effects of vaccination prior to transit and administration of florfenicol at time of arrival in a feedlot on the health of transported calves and detection of Mannheimia haemolytica in nasal secretions. *Am J Vet Res*. 63(2):251-2566. 2002.

Fent GM, Fulton RW, Saliki JT, Caseltine SL, Lehmkuhl HD, Confer AW, Purdy CW, Briggs RE, Loan RW, Duff GC. Bovine Adenovirus-7 infections in postweaning calves. *Am J Vet Res.* 63(7):976-978. 2002.

Fulton RW, Ridpath JF, Saliki JT, Briggs RE, Confer AW, Burge LJ, Purdy CW, Loan RW, Duff GC, Payton ME. Bovine viral diarrhea virus (BVDV) 1b: Predominant BVDV subtype in calves with respiratory disease. *Can J Vet Res.* 66(3):181-190. 2002.

Briggs RE, Tatum FM. LktA deletion mutant of *P. haemolytica*. U.S. Patent #6,495,145. Dec. 17, 2002.

Thumbikat P, Briggs RE, Kannan MS, Mahewsaran SK. Biological effects of two genetically defined leukotoxin mutants of *Mannheimia haemolytica*. *Microb Pathog.* 34(5):217-26. 2003.

Briggs RE, Tatum FM. Molecular genetic construction of vaccine strains of Pasteurellaceae. U.S. Patent #RE38,028. March 11, 2003.

Frank GH, Briggs RE, Duff GC, Hurd HS. Effect of intranasal exposure to leukotoxin-deficient *Mannheimia haemolytica* at the time of arrival at the feedyard on subsequent isolation of *M. haemolytica* from nasal secretions of calves. *Am J Vet Res.* 64(5):580-5. 2003.

Fulton RW, Step DL, Ridpath JF, Saliki JT, Confer AW, Johnson BJ, Briggs RE, Hawley RV, Burge LJ, Payton ME. Response of calves persistently infected with noncytopathic bovine viral diarrhea virus (BVDV) subtype 1b after vaccination with heterologous BVDV strains in modified live virus vaccines and *Mannheimia haemolytica* bacterin-toxoid. *Vaccine.* 21(21-22):2980-5. 2003.

Briggs RE, Tatum FM. Temperature sensitive plasmids of *P. haemolytica*. U.S. Patent #6,573,093. June 3, 2003.